4. Interpret each diagram to determine the multiplication sentence.

a) $(3c)(3c) = 9c^2$

b) $m(m + 3) = m^2 + 3m$

c) $2r(r + 2) = 2r^2 + 4r$

6. The display models $2n(2n + 1)$. This matches part c.

9. a) i) $(3m)(4m) = 12m^2$

ii) $(-3m)(4m) = -12m^2$

iii) $(3m)(-4m) = -12m^2$

iv) $(-3m)(-4m) = 12m^2$

v) $(4m)(3m) = 12m^2$

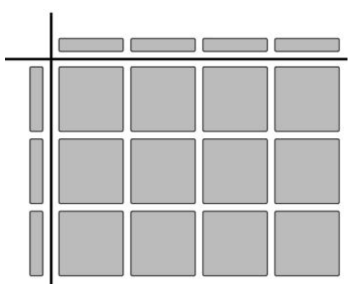
vi) $(4m)(-3m) = -12m^2$

b) There are only two answers in part a, $12m^2$ and $-12m^2$, because the products have the same two factors, $3m$ and $4m$. The signs of the coefficients all differs.

c) Algebra tiles can be used to model all the products.

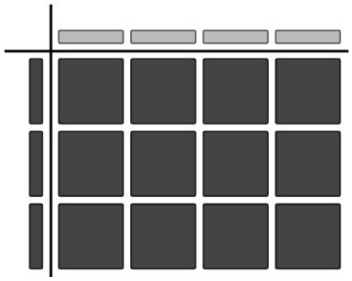
i) $(3m)(4m)$

Make a rectangle with dimensions $3m$ and $4m$. Twelve m^2-tiles fill the rectangle.



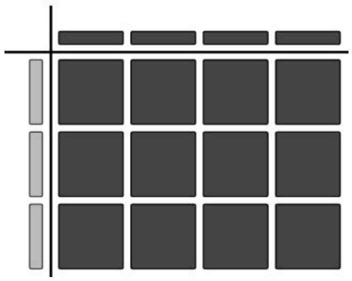
ii) $(-3m)(4m)$

Make a rectangle with guiding tiles: three $-m$-tiles along one dimension; four m-tiles along the other dimension. Twelve $-m^2$-tiles fill the rectangle.



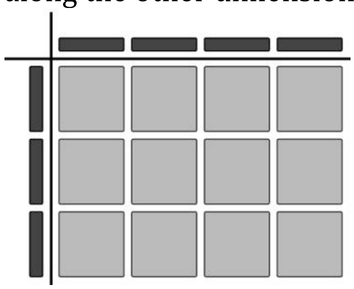
iii) $(3m)(-4m)$

Make a rectangle with guiding tiles: four $-m$-tiles along one dimension; three m-tiles along the other dimension. Twelve $-m^2$-tiles fill the rectangle.



iv) $(-3m)(-4m)$

Make a rectangle with guiding tiles: four $-m$-tiles along one dimension; three $-m$-tiles along the other dimension. Twelve m^2-tiles fill the rectangle.



12. I used the distributive property to determine each product.

a) $2x(x + 6) = 2x(x) + (2x)(6)$
$= 2x^2 + 12x$

b) $3t(5t + 2) = 3t(5t) + (3t)(2)$
$= 15t^2 + 6t$

c) $-2w(3w - 5) = (-2w)(3w) + (-2w)(-5)$
$= -6w^2 + 10w$

d) $-x(2 + 8x) = (-x)(2) + (-x)(8x)$
$= -2x - 8x^2$

e) $3g(-5 - g) = 3g(-5) + 3g(-g)$

$= -15g - 3g^2$

f) $(4 + 3y)(2y) = 4(2y) + 3y(2y)$
$= 8y + 6y^2$

g) $(-7s - 1)(-y) = (-7s)(-y) + (-1)(-y)$
$= 7sy + y$

h) $(-3 + 6r)(2r) = (-3)(2r) + 6r(2r)$
$= -6r + 12r^2$

22. a) Divide the shape into two rectangles.
One rectangle has dimensions $7x$ by $5x$.
Its area is $(7x)(5x) = 35x^2$.
The other rectangle has dimensions $(7x - 3x)$ by $(12x - 5x)$, or $4x$ by $7x$.
Its area is $(4x)(7x) = 28x^2$.
Add the two areas to determine the area of the composite shape:
$35x^2 + 28x^2 = 63x^2$

19. a) The area of a rectangle is length × width.
Area of large rectangle: $(3s^2 + 2)(2s) = 3s^2(2s) + 2(2s)$
$= 6s^2 + 4s$
Area of small rectangle: $(s + 1)(2s) = s(2s) + 1(2s)$
$= 2s^2 + 2s$

b) To determine the area of the shaded region, subtract the area of the smaller rectangle from the area of the larger rectangle.
$(6s^2 + 4s) - (2s^2 + 2s) = 6s^2 + 4s - 2s^2 - 2s$
$= 6s^2 - 2s^2 + 4s - 2s$
$= 4s^2 + 2s$

c) Substitute $s = 2.5$ in $4s^2 + 2s$.
$4(2.5)^2 + 2(2.5) = 25 + 5$
$= 30$
The area is 30 cm².

20. I used the distributive property to determine each product.

a) $3m(2n + 4) = 3m(2n) + 3m(4)$
$= 6mn + 12m$

b) $(-5 + 3f)(-2g) = (-5)(-2g) + (3f)(-2g)$
$= 10g - 6fg$

c) $7m(-6p + 7m) = 7m(-6p) + 7m(7m)$

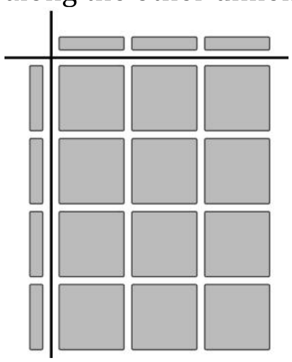
$= -42mp + 49m^2$

d) $(-8h - 3k)(4k) = (-8h)(4k) + (-3k)(4k)$
$= -32hk - 12k^2$

e) $(-2t + 3r)(4t) = (-2t)(4t) + 3r(4t)$
$= -8t^2 + 12rt$

f) $(-g)(8h - 5g) = (-g)(8h) + (-g)(-5g)$
$= -8gh + 5g^2$

v) $(4m)(3m)$
Make a rectangle with guiding tiles: four m-tiles along one dimension; three m-tiles along the other dimension. Twelve m^2-tiles fill the rectangle.



vi) $(4m)(-3m)$
Make a rectangle with guiding tiles: four m-tiles along one dimension; three $-m$-tiles along the other dimension. Twelve $-m^2$-tiles fill the rectangle.